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für Waffen, Optik und Ausrüstung

Comparison test: All-round binoculars with integrated rangefinders

Leica Geovid, Zeiss Victory RF, Swarovski EL Range

Black magic

Starting this year, hunters have had the choice of three pairs of binoculars with integrated rangefinders and masses of high tech from three leading manufacturers. The price difference between the three is less than €200, which, in a price bracket over €2,500, should hardly make a difference. JAGDPRAXIS has put three top models with 8-fold magnification and 42 mm (Leica, Swarovski) or 45 mm objective lenses (Zeiss) to the test bench. All three had to show what their optics are made of and their performance in the fields. And would you believe it – the differences are more than just fine in the Rolls-Royce class …

Today, hunters are more likely to attempt much longer shots than they would have 50 years ago. Advances in weapon technologies, ammunition and scopes provide the technical prerequisites for this – precise rifles, high-performance cartridges with reliable bullets and high-magnification riflescopes bring the target much closer to the hunter's eye. Nevertheless, the principles of ballistics haven't changed at all – even modern projectiles fly along a ballistic curve, and the greater the target distance, the more often you shoot too low. This may be considerably less the case with a modern .270 WSM than an old 9.3 x 72 R Forester Cartridge, but it still happens, all the same.

Then you have the problem of angle shots – if the target is above or below the hunter's position, the projectile is no longer subjected to the full force of gravity, and low shots are less frequent than would be expected.

This makes it clear that, despite state-of-the-art hunting equipment, hunters must always know three things to accurately place their bullets in the game, even at long distances:

- precise knowledge of the **ballistic properties of the ammunition used**
- the **true shot distance**
- the **angle** for angle shots and the resulting changes to the bullet's flight.

As long as these parameters are known, precise hits are no longer a problem. At least in theory. Unfortunately, there are other factors that can interfere with the hunter's nominally perfect calculations.

- Depending on its angle and strength, the **wind** can strongly influence the flight path of projectiles over long distances. Even in light winds, lateral deviations of 30 to 40 cm are completely normal. The ability to 'read' the wind makes it possible to compensate for such effects, but this requires years of experience and practice. In purely theoretical terms, this can never be learned. Only numerous shots on a 300-metre range and precise documentation of wind speeds and deviations of the location of impact on the target can – and only after a considerable time – ensure the necessary certainty when shooting game.
- The second factor in the case of long shots is the game itself – and here, any number of shots on a target range make no difference at all. It's quite simple: a rifle bullet takes time to reach its target – the further away it is, the longer it takes. For instance, the flight time of a .308 Winchester with an RWS 11.7 g UNI-Classic bullet over a distance of 300 meters is as much as 0.46 seconds – and that assuming the accuracy of the manufacturer's details on the muzzle velocity. With the shorter barrels predominantly in use today, the flight time could well be a little over half a second.

If the bullet is already on its way and the game moves, it is impossible for it to hit the intended point of impact. Hunters simply have no control over that. At first sight, half a second doesn't seem like much at all, but if a chamois decides to jump, it's more than long enough for a paunch shot.

Long-distance shots should therefore always be well considered – the intention of these fundamental considerations in advance is to make it clear that even the most modern high-tech hunting equipment should never tempt hunters to take insufficiently considered long shots at game.

Don't guess, measure

The actual (not the roughly estimated) target distance is one of the most important factors for long-distance shots. Such hunting situations are not only found on mountain hunts – where chamois and ibex are found, the average (!) shot distance is frequently over 200 metres. It can also be very useful (and ethical) to know exactly where my weapon will hit the game at 250 metres from a high seat – particularly when one thinks of wounded game that disappears into cover after the first shot, only to appear again much further away, giving you the chance to place a second shot.

Distance can be measured; the military have been pioneers in this for ages. Rangefinders for naval and tank guns were constantly developed over the years and eventually became portable. Split-image rangefinders are neither very accurate nor convenient or easy to use.

Rangefinders became interesting for the hunting fraternity with the appearance of the first laser rangefinders, as these finally made it possible to determine shot distances at the press of a button. Such devices transmit a laser beam that is reflected by the target and then captured again by the device. The measuring system employs a real-time clock to calculate the distance from the time delay between the transmission and reception of the beam – an extremely precise technology that also takes up very little space.

Although the first rangefinders were about the same size as a box of rifle cartridges, they soon shrank to the size of a packet of cigarettes. With the onset of widespread use (for instance among golfers and surveyors), the technologies became increasingly cheaper.

So it was only logical that the next step would be the integration of a laser rangefinder in a pair of binoculars.

In 1992, Leica, the German optical equipment

manufacturer, launched the Geovid, the world's first binoculars with a built-in rangefinder. As the initial target group was authorities and the military market, this meant that a compass was integrated, too.

Not only its price, but also its bulky size and extreme weight, made the original Geovid not all that popular in the hunting community – it was around twice the size and weight of a normal pair of binoculars. In 2004/2005, Leica launched the new Geovid BRF – no larger or heavier than binoculars without a rangefinder. Although competing manufacturers were quick to notice the potentials of this bestseller, it still took several years until Zeiss had its Victory RF models ready for the market. Leica had safeguarded its ideas with such cast-iron patents that the Zeiss engineers were forced to work their way around them. A first for Zeiss, though, was the ballistics computer in the Victory RF.

Swarovski, the third of the European optical giants, took even longer. It was 2011 by the time its EL Range was first presented. The Tyroleans took a different path for the integration of their rangefinder technology – the electronics were slung below the tubes in so-called measuring fins rather than being integrated in the binocular housing. The idea behind this was to prevent the optical performance of the binoculars from suffering from beam splitters located inside the housing.

The EL also featured a kind of integrated ballistics computer for the calculation of angle-shot deviation. With these features, Zeiss and Swarovski left the Geovid behind them in technical terms, as the latter could 'only' display the measured distance. In 2013, Leica followed up with a completely new construction packed with computing power – the Geovid HD-B.

But first of all, let's take a look at the three candidates and their technical and constructional differences:

TECHNICAL DATA: MANUFACTURERS' DETAILS

	Zeiss Victory RF	Swarovski EL Range	Leica Geovid HD-B
Model	8x45	8x42	8x42
Body	Magnesium	Magnesium	Magnesium
Magnification	8×	8×	8×
Lens diameter	45 mm	42 mm	42 mm
Exit pupil diameter	5.6 mm	5.3 mm	5.3 mm
Twilight factor	19	18.3	18.3
Field of view at 1,000	125 m	137 m	130 m
Close focusing	5.5 m	5 m	5 m
Dioptre	+/- 3.5 dpt.	-7/+5 dpt.	+/-4 dpt.
Eye point	16 mm	19.2 mm	18 mm
Interpupillary	54–76 mm	56–74 mm	56–74 mm
Height	167/135 mm	166/117 mm	178/128 mm
Weight	995 g	910 g	980 g
Measuring range	10–1,200 m	30–1,375 m	10–1,825 m
Measuring accuracy	+/- 1 m to 600 m +/- 0,5 % over 600 m	+/- 1 m over the entire measuring range	+/-1 m to 500 m +/- 2 m to 1,000 m +/- 0,5% over 1,000 m
Battery	3-volt lithium	3-volt lithium	3-volt lithium
Price	€2,595	€2,780	€2,650

Of the three models tested, the Zeiss Victory RF has been on the market the longest.

Zeiss 8 x 45 Victory RF

The Zeiss 8 x 45 RF (RF for rangefinder) has a tough but light magnesium housing that is protected against knocks and impacts by rubber armouring. Its construction is conventional, which means it has a closed bridge.

The optical design of the 45 RF corresponds to that of the 42 mm Victory models and is based on a four-lens achromatic system with fluoride lenses and Abbe-König prisms. The eyecups have four detent settings and can be completely removed for cleaning. The ocular and objective lenses feature a Zeiss LotuTec coating, a type of hydrophobic nano-coating that is standard for today's leading brands. It lets water simply roll off the lenses and makes them easy to clean. The binoculars are focused with a large knurled wheel, and the dioptre compensation is set with a wheel on the left ocular. Zeiss integrates the transmitter and receiver system in the tubes. The laser beam is sent through one tube and the reflected signal is received in the other. This could well be the reason for the three-millimetre larger lens diameter, as the electronics interrupt the ray path in the optical system. In other words, 'it costs you light'. To ensure that the view is not noticeably darker than with 42 mm binoculars without rangefinder technology, it is naturally a simple technical workaround to increase the diameter of the objective lens.

Anyway, the housing construction of the 42 mm models couldn't have been used for the RF models, as the measuring system has entirely different requirements. Zeiss installs a high-performance Class 1 laser with a range of 10 to 1,200 metres in the Victory models. Even at maximum range, the measuring process takes less than a second to deliver results. The measured distance is displayed by a self-illuminating four-figure LED read-out. The electronics are activated by pressing the rangefinder button and holding it down. This displays the sighting mark in the view, and measuring is initiated as soon as the button is released ('one-touch principle'). This is intended to reduce distance errors caused by delays or measuring beam shake and prevents inadvertent sighting on objects in front of or behind the actual target – one of the most common causes of measuring errors and 'unexplainable misses'. This model also features a scanning mode for measuring the distance of small and moving targets. The Zeiss RF can switch between metres and yards, and its 3-volt lithium battery is housed in a watertight sealed battery compartment integrated in the bridge.

The ballistics computer

The Victory RF has six permanently stored ballistic curves to cover the most common calibres. Furthermore, it offers a choice between a point-blank shot at 100 m or MRD.

The curves are printed in the user manual and users pick the best match to the calibre they use. When the ballistics computer is activated (Zeiss calls this system BIS/Ballistics Information System), the read-out displays the holdover correction for the distance and the chosen ballistic curve immediately after showing the measured distance. If, for example, the read-out shows H 10, the aim must be set 10 cm higher – by a corresponding height adjustment of the reticle of the riflescope or by setting an appropriate value with the rapid reticle adjustment (ASV) of the riflescope, and then aiming as usual. The choice of ballistic curves is made with the smaller of the two buttons – the mode button – below the measuring button. This button is no longer needed when the ballistic curve has been selected.

With dimensions of 167 × 135 mm (L × W) and a weight of 995 g, the Victory RF is only slightly larger and heavier than conventional 42 mm glasses. A Victory 8 x 42 HT is around 200 g lighter. Slight compromises must be accepted in the case of field of view. The RF offers 125 m, while the view with the 42 mm glass is wider, with 136 metres. At a price of €2,595, the Zeiss Victory 8 x 45 RF is the least expensive of the trio we tested.

Despite its open bridge construction, the Swarovski offers real internal focusing.

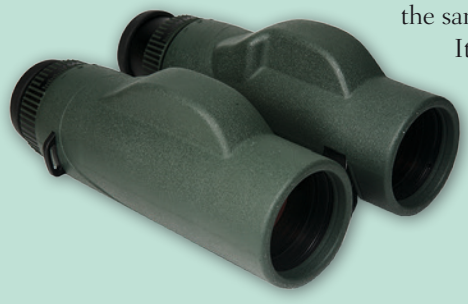
Swarovski 8x42 EL Range

Based on Swarovski's EL line, the Range was launched in 2011 and owes its open bridge construction with practical holding and handling characteristics to this design.

Nevertheless, it offers real internal focusing, a very sophisticated feature in binoculars without a hinged bridge. The mechanism is installed in the upper crosspiece, and the focusing element is moved by rocker levers and connecting rods. The roof-prism system with P-coating for phase correction is also contained in a lightweight rubber-armoured magnesium body. This armour is, however, not black, but the typical dark green of the Tyrolean mountain peaks.

Each ocular ring is equipped with a setting ring that is pulled out to set the dioptre compensation and pushed back after setting. This effectively prevents inadvertent twisting and loss of the compensation settings. Just like the standard EL model, the Range also features Swarovski's own lens coatings, Swarobright and Swarotop, both now optimised for use with laser technology. Swarovski also coats all exposed lens surfaces with a nano-coating that goes by the name of Swarodur. The eyecups can be retracted for spectacle wearers and completely removed for cleaning, and offer four positions with precisely defined detents. In optical terms, there should hardly be any difference between our test model and the EL version without the rangefinder.

Thanks to its low-slung measuring fins, the Swarovski achieves outstanding transmission values.



Weighing 910 grams, the Swarovski is lighter than the Zeiss, but its length of 166 mm is almost the same.

It edges ahead of the Zeiss with its field of view with a satisfying 136 metres. The rangefinder electronics are located in so-called measuring fins on the underside of the tubes. The Swarovski glasses do without a beam splitter, so there is no loss of brightness when viewing – and no need for the light-gathering powers of a larger-diameter objective lens.

The laser has a range of 30 to 1,375 metres and Swarovski also takes advantage of one-touch technology; pressing the rubber-armoured measuring button activates a small red circle in the right-hand ocular. On releasing the button, the system displays the measured distance in metres or yards.

The Swarovski rangefinder also features a scan mode – all you have to do is press the button and keep it pressed. The brightness of the distance read-out adapts automatically to the lighting conditions and can also be set manually to one of five different levels.

No holdover correction read-out

Unlike the Zeiss, the EL Range doesn't have an onboard ballistics computer, so there is no holdover information for correcting your shot. It also offers no hard-wired ballistic curves or manual input options for various different calibres. It is assumed that you already know the ballistic curve you need for your ammunition.

If you are lucky, you may have a riflescope with rapid reticle adjustment (ASV) or a ballistic reticle that can be used to directly convert the shot distance. The input of a holdover point is rendered unnecessary by an ASV.

Despite this, the EL Range does have another very useful feature – angle-shot correction.

Uphill or downhill placement of a desired point-blank shot requires a good gut feeling along with plenty of experience in ballistics – the EL Range takes care of this quite simply with its electronics.

The integrated angle-shot program displays the corrected ballistic distance for shots in sloping terrain. When the angle-shot program is activated, the EL Range displays two distances after measuring – at the top, the distance actually measured and below that, the so-called ballistic distance under consideration of the shooting angle.

On level terrain, the two should be identical, but the larger the angle is, the greater the difference between them. The ballistic distance is always a smaller value. Users can also choose to display the angle in degrees, but then the calculation would have to be done manually. This feature means that point-blank angle shots are no problem at all when using ASV on a riflescope, even at very long distances.

This program will be unnecessary when shooting on level terrain and can be deactivated in the menu.

At a price of €2,780, the Habicht is the most expensive of the three models tested.

Leica's new Geovid has unusual 'banana-shaped' tubes that are a result of its new construction concept, a mixture of Porro- and roof-prism systems.

Leica Geovid HD-B 42

Although Leica is the pioneer of binoculars with integrated rangefinders, our test glass was the latest model on the market. It was first presented to the general public at the Shot Show in Las Vegas in January 2013, and deliveries to dealers have only just begun.

In comparison with earlier Geovids, a first look at its housing reveals that the new generation is a completely new construction.

The open bridge is really new – it is a trend that has obviously taken root in contemporary binocular construction. Leica, too, has chosen a rubber-armoured magnesium-alloy housing – in Leica's typical black, as tradition demands.

These days, magnesium alloy is the first choice in the construction of top-priced binoculars, thanks to its lighter weight than aluminium and its considerably greater robustness. The fact that it is also significantly more expensive obviously plays no role whatsoever in this price category.

The two halves of this pair of binoculars have a pronounced bend – or an elegant curved form – depending on how you look at it. This 'banana shape' is by no means purely a design feature, but the consequence of an entirely new prism system – a kind of cross-bred Porro- and roof-prism concept. At first glance, this may seem more than superfluous, but there is a logical reason for it – making room for the electronics installed in the two tubes.

Leica remains true to its established constructional principles and installs the measuring system components inside the binoculars' optical system. From the old Geovids, the people in Solms learned early on, particularly here, that beam splitters are only installed at the expense of light – and have attempted to reduce this effect to an absolute minimum. The loss of light due to the beam splitter in the right-hand tube has been significantly reduced by the new construction concept. The majority of the optical components originate from the current Ultravid generation, and are therefore state of the art.

The large centre barrel is used for focusing and each of the oculars has a ring – at the left for setting dioptre compensation and at the right for changing the read-out settings.

The front lenses are coated with Leica's proprietary AquaDura™ hydrophobic coating.

In contrast to those of the Zeiss and Swarovski models, Leica's rotating eyecups with detents are not quite completely removable.

The stated 130-metre field of view beats the Zeiss, but can't compete with the Swarovski. Weighing in at 980 grams, the Leica is around the same weight as the Zeiss, but is slightly longer at 178 mm, which could well be due to its 'banana construction'.

The Geovid also makes use of a Class 1 eye-safe laser and, with a range of 10 to 1,825 metres is considerably more powerful than either the Zeiss or the Swarovski.

The first press of the button activates the red rectangular sighting symbol. The button must then be pressed a second time to send the laser beam on its way.

If the finger stays on the button, the measuring electronics switch to scan mode and initiate one measurement after another.

The read-out can be switched between metres and yards.

The LED read-out adapts automatically to the lighting conditions; a manual brightness setting option is not provided.

The ballistics computer

Leica has installed a ballistics program with a very wide range of functions and provides a slot for entering user-specific parameters into the ballistics computer in the binoculars from a tiny micro-SD memory card. The user can upload these custom parameters to the card from a computer – quite a lot of technical stuff that demands a certain level of basic technical skills.

The Leica engineers dug deeply into their bag of tricks when programming the ballistics computer – it even takes parameters like temperature, barometric pressure and the shot angle into account. So an angle-shot correction is offered here, too.
All it needs to display the ambient temperature and air pressure any time is a short tap on the menu button. If you press the button longer, the electronics take you into the custom programming mode.
In principle, the ballistics program works in the same way as the one offered by Zeiss. In addition to the distance measured, it displays the holdover value, i.e. the required shot correction. This value can be displayed in centimetres or inches, or as clicks for ASV adjustment. As the adjustment per click differs from scope to scope, it also allows the input of the click adjustment to the point of impact in millimetres.
It also immediately calculates the ballistic distance for angle shots at the same time.
Presets also allow selection of the point-blank shot distance – for 200 metres in addition to 100 metres and MRD.
Leica also provides a choice of six hard-wired ballistic curves that can be selected from the menu. In addition to these, the precise parameters of the hunter's own cartridges can be input from the SD card. Knowledge of the measured muzzle velocity of the weapon being used is also necessary – only then does the calculation with custom parameters make really good sense.
If the projectile, V 0 and the height of the optical axis above the bore axis of the barrel are known, users can enter these parameters into a ballistics program on the Leica website and upload the results to their micro-SD memory card.
The Leica package includes an adaptor for the use of this tiny memory card in the conventional card reader slot of a PC.
The Geovid automatically imports the data from the memory card as soon as it is inserted and, from then on, uses these parameters for computation – with significantly greater accuracy than with the six hard-wired ballistic curves.
Summing up, the Leica ballistics computer has the largest number of functions and, in terms of computing power, the best preconditions for accurate results.
But there could have been more, and that the spin drift (spin-related lateral deviation) could have been calculated, as it is in modern ballistics programs like QuickTARGET. This would entail even more processing power and the display of yet another value – probably more confusing than helpful for many users. But we are still quite a way from the end of what's possible – ballistics has a lot more to offer.
At a price of €2,650, Leica has strategically positioned the new Geovid between the Zeiss and the Swarovski.

The battery compartment also houses the slot for the micro-SD card – and the Leica package even includes a pair of tweezers for extracting it.

The Geovid (left) looks the biggest and the Zeiss (centre), with its slightly wider objective lens, is the heaviest of the trio.

Optical performance

Before the JAGDPRAXIS team took the three high-tech candidates out for practical testing in the field, they first went to the laboratory of the department of optics and optoelectronics at the Georg-Simon-Ohm Institute in Nuremberg. This is where not only optically relevant data like transmission, resolving power, edge sharpness, contrast and colour fringing were determined, but also where the manufacturers' details regarding magnification, field of view and dioptre compensation were checked and important factors like binocular alignment and field rotation were assessed.

Professor Hanskarl Treiber and his student group also made a visual assessment of the LED read-out of the measured values in the binoculars.

The results here are a jungle of numbers, so we requested Professor Treiber to summarise them in brief statements about each of the three test candidates.

Leica 8 x 42 HD-B: These binoculars fulfil all the requirements of the DIN-ISO standards for high-performance instruments. No deficiencies were determined in practical use. Image quality, image field and brightness meet all expectations required of premium-class binoculars – a pair of premium-class binoculars with no cause for complaint.

Swarovski 8 x 42 EL Range: These binoculars fulfil all the requirements of the DIN-ISO standards for high-performance instruments. No deficiencies were determined in practical use. Image quality, image field and brightness meet all expectations required of premium-class binoculars. Optimal transmission values – a pair of premium-class binoculars with no cause for complaint.

Zeiss Victory 8 x 45 RF: With the exception of the field rotation, these binoculars fulfil all the requirements of the DIN-ISO standards for high-performance instruments. The binocular alignment, however, is excellent.

Although the transmission and its uniformity are not ideal, these deficiencies would not be particularly irritating in practical use – a very good pair of binoculars with little cause for complaint.

What do the test results tell us?

In this test, all three of the exquisite candidates are high-performance binoculars that are characterised by extremely high resolving power and a short close focusing limit. All three are suitable for use by spectacle wearers without any restrictions.

The **eye relief** (the measured position behind the lens of the eye) is 18 mm in all cases. The standard for high-performance binoculars specifies a minimum of 16 mm.

All three glasses also rate well above the standards

for **binocular alignment** (collimation). This is determined at the oculars of the binoculars. This describes the true misalignment of the axes that the eyes must compensate for to avoid seeing a double image. Typical consequences of poor alignment are rapid eye fatigue, a feeling of being unwell, headaches or a complete inability to superimpose the two partial images.

Binocular alignment is carried out as one of the final steps in the construction of binoculars with testing and adjustment tools tailored to the particular binoculars (eccentric rings, prisms or movement of the ocular assembly). All three candidates gained top marks in this discipline.

The situation looked a little different in the case of **field rotation** (image distortion). Vertical and horizontal lines of the objects viewed must be reproduced as such. The DIN standards for high-performance optical instruments tolerate deviations of up to one angular degree.

In this discipline, the Zeiss Victory showed a slight weakness with a horizontal deviation of 1.1 angular degrees and a vertical deviation of 1.2 angular degrees – only a hair's breadth over the specified standard but not sufficient to fulfil the DIN specifications for high-performance optical instruments and only enough to place it in the ranks of 'Instruments for general use'.

In plain language: hardly anyone will ever notice this when using these binoculars, but it is measurable all the same.

And should really have been noticed in final checking by the QA people at Zeiss.

Brightness differences

In the case of **transmission** (i.e. transparency as the most important determinant of image brightness), significant differences were revealed not only under laboratory conditions but also out in the field. The clear front runner here is the Swarovski EL Range, with 91% day transmission and over 89% transmission at night, in both binocular tubes. The slight difference between the day and night transmission values also shows that the Tyroleans have turned out a very well-balanced optics package with their EL Range.

TEST RESULTS: BINOCULARS WITH INTEGRATED RANGEFINDERS

	Swarovski EL Range 8x42	Zeiss Victory RF 8x45	Leica HD-B 8x42
Measured	8.0	7.9	8.1
Entry pupil	43.5 mm	47 mm	43 mm
Exit pupil	5.9 mm	6.5 mm	5.8 mm
Field of view at 1,000	136 m	128 m	128 m
Spectacle-wearer	yes	yes	yes
Interpupillary	56–74 mm	54–76 mm	55–74 mm
Eye relief	18.5 mm	18.5 mm	18.2 mm
Close focusing limit	5.2 m	5.0 m	5.7 m
Transmission, day	right 90.9 % left 91.1 %	right 70.2 % left 85.5 %	right 86.3 % left 87.7 %
Transmission, night	right 89.6 % left 89.2 %	right 62.6 % left 75.2 %	right 84.7 % left 84.3 %
Binocular alignment *	horizontal misalignment: 32.1' vertical misalignment: 9.0'	horizontal misalignment: 4.6' vertical misalignment: 4.7'	horizontal misalignment: 3.4' vertical misalignment: 9.2'
Field rotation **	horizontal: 0.20° vertical: 0.14°	horizontal: 1.10° vertical: 1.20°	horizontal: 0.20° vertical: 0.14°
Resolving power	3.7	3.5	3.9
Dioptre	+ 6.5 dpt., –7 dpt.	+ 4 dpt., –4 dpt.	+ 4.5 dpt., –6 dpt.
Low temperature test (–40 °C)	passed	passed	passed
High temperature test (+70 °C)	passed	passed	passed
Waterproof	yes	yes	yes

* permitted value for high-performance binoculars: vertical 20' and horizontal 60' (measured values in angular minutes)

** permitted value for high-performance binoculars: +/–1° (measured values in angular degrees)

The transmission values of the Leica are also well balanced, with 87% day transmission and 84% at night. Not quite good enough for top marks, but still very good.
The Zeiss Victory RF trails behind in this discipline, namely with a day transmission value of 85.5%, and that only at the left ocular. On the right-hand side, with the rangefinder system, it only manages a meagre 70.2%.
The difference is similarly disappointing for night transmission – 75.2% at the left and 62.6% at the right.
In practical use, the right-hand side of the binoculars appears noticeably darker than the left.
The tests here show that Swarovski's idea of installing the rangefinder components below the tubes is the right way to go.
The new mixed Porro-roof-prism concept from Leica also appears to work. It produces not only good transmission values, but also almost identical values for both tubes. Zeiss limps along quite a way behind the others – an obvious reason why the objective lens diameter has been increased to 45 mm – this increases the brightness of the view in practical use, and users will hardly notice the difference to 42 mm models with better transmission values.
Another important point is **field of view** – to achieve top marks, it has to be at least 130 metres. Only the Swarovski manages this with an impressive 136 metres. Zeiss and Leica both offer 128 metres – and both drop a point in this test discipline.
The JAGDPRAXIS test results expressed in points look like this.
We subtracted one point for each of the three glasses in the features category, as none of them had quick-release carrying straps.
The Zeiss lost a point for **mechanical quality** for not meeting the standards for field rotation. The rating for **ease of handling**, determined by our testers in the field, was already taken into account. Here, the Zeiss lost points again – our test team much preferred the open bridges of the Leica and the Swarovski. In the category **value for money**, Leica and Swarovski each earned eight points for being optically excellent but very expensive.
The Zeiss is equally expensive, but showed consid-

In the case of the Zeiss, measuring is activated with the large button. The smaller button below it is used exclusively for programming the ballistics computer.

The two control buttons of the Geovid are next to each other. The 'measuring button' of the Leica (left) is perceptibly higher.

No chance of confusing the buttons on the Swarovski – there is only one button, on the bridge.

erably lower transmission values and, as a result, earned only six points. The clear overall winner in the optical stakes is the Swarovski, followed closely by the Leica with a lag of only three points.

Out in the field

Then it was time for the three glasses in our test to show what they are made of out in the field. Here, above all, the criteria of our test concerned handling and subjective impressions with regard to contrast and colour fidelity. For this, we intentionally looked for critical situations for the use of binoculars, like viewing against the light and observing game standing in woodland shadows.

All three candidates came through this with flying colours – the optical impression gathered in everyday hunting situations is outstanding. The key factors here are thus personal preferences and taste.

The Swarovski delivers a relatively soft view with very good colour fidelity, which is a good reason why they have so many loyal customers in the birding community – people who want to see the true nature of every single feather. The Zeiss delivers a whiter and somewhat cooler view, and the Leica is somewhere in-between – impressive with its very good contrast.

The two open-bridge models (Leica and Swarovski) found more friends in the handling category than the conventionally constructed closed-bridge Zeiss.

Our field test focused primarily on evaluating the performance of the integrated rangefinders and ballistics programs. They are, after all, the special feature of the three binoculars in our test.

Our test team took the candidates out into the field and then to the shooting range to check them out in detail – and must have pressed the measuring buttons many hundreds of times. The results were precisely documented and evaluated. Before getting to use one of the respective test glasses, each tester had to program it to meet their specific requirements according to the instructions in the manual.

Rangefinder and ballistics programs

None of the test glasses showed any weaknesses in the **precision at 500 metres** category. At the standardised distances of 200, 300 and 500 metres, all displayed precisely these distances on their read-out – this was no particular surprise to us, as even today's cheap rangefinders show hardly any shortcomings in this respect.

The matter of **range** paints a different picture – to earn full marks, the rangefinders must reach a distance of 1,500 metres. The Leica made easy work of this – according to the manufacturer's information, the very high-powered laser unit installed can achieve distances of 1,800 metres and more.

We were, however, surprised by the other two brands, whose manufacturers tend to understate.

With the Zeiss, stated as having a range of 1,200 metres, we actually registered readings at up to 1,380 metres. The Swarovski's specified maximum range of 1,375 metres even managed to reach the 1,500-metre mark, and our longest measured distance was 1,523 metres.

There were only minimal differences in the category **measuring accuracy and speed**. Under 600 metres, our maximum distance for this rating point, we encountered hardly any false readings. If one of the devices ever showed nothing at all, this was the result of hands being too shaky or unsuitable measuring targets.

In this discipline, all three delivered very precise and reliable results and, in general, just one press of the button was enough.

We did, however, observe minimal differences in the measuring speeds – Swarovski is a touch slower than Zeiss and Leica. Nothing dramatic, but if you are looking for it, you'll find it. In practice, it makes no difference at all.

All three glasses tested have short-range suppression and a scan mode – which is also obligatory in this price bracket.

The read-outs are well adjusted and adapt automatically to ambient lighting conditions.

Of the three, only the Swarovski offers a manual brightness setting option.

In the case of the Leica, the measuring button must first be pressed once to activate the sighting point, and then pressed a second time to initiate measuring. With the other two glasses, pressing the button once activates the sighting point, and the measuring process begins when the button is released. Our testers managed very well with both methods. Here, getting used to the method plays more of a role than the consideration of which offers a real advantage.

Taking a look at the results of the comparison in this category reveals that Leica and Swarovski lead the field by a 'read-out's breadth'.

There are no significant differences between the three when it comes to measuring accuracy, measuring reliability/speed or read-out qualities. The Swarovski may be a touch slower at measuring, but this is made up for by the option for manually setting the read-out brightness.

➤ more on page 14

Binoculars with integrated laser rangefinders (8× magnification/42–45 mm objective lenses)

How we rated our test candidates

This category applies to binocular glasses with integrated laser rangefinders.
First of all, we assessed the performance of the binoculars and rangefinders separately.
Each of these component parts can potentially be awarded 100 points in the subgroups,
coming to a maximum of 200 possible points at the end of the test.

BINOCULAR OPTICS RATING

Field of view (max. 10 points)

A pair of binoculars' field of view is extremely important, as a better overview contributes significantly to viewing comfort. We award full marks for a field of view greater than 130 metres at 1,000 metres. We deduct one point for every two metres less than this limit.

Resolving power (max. 15 points)

Resolving power, also known as resolution, is the ability of the optical system to make the separation between two closely neighbouring points clearly visible to the user, an important criterion for the quality of an optical system. Resolving power is measured in angular seconds. At a measured resolving power of 4, a user looking through the optical system would be able to recognise two points separated by a distance of two centimetres as individual objects at a distance of 1,000 metres. A resolving power of 10 would apply to two points separated by five centimetres at a distance of 1,000 metres. Full marks are awarded to optical systems that have a resolving power of 6 angular seconds. Two points are deducted for every angle second above this value.

Transmission (max. 15 points)

The transmission value is a decisive factor for hunting glasses. The transmission is measured in the daytime and at night. We take only the daytime transmission value as an average from both tubes when awarding points. Full marks of 15 points are awarded for daytime transmission values of 90% and above. Every 2% less than this value leads to the deduction of one point.

Actual magnification (max. 10 points)

The manufacturers of binoculars state a magnification factor for their products, and this is often a decisive factor in the purchasing decision. At this point in the test, we determined whether the manufacturers' data are correct or differ significantly from the stated value.
We measured the actual magnification. A 5% deviation is tolerated, and one point is deducted for every percentage point beyond this allowance.

Overall optical package (max. 10 points)

This covers a whole range of tests that are important for determining the quality of a pair of binoculars. Here, we assess edge sharpness, contrast colour fringing (chromatic aberration), compensation for long- and short-sightedness (dioptre compensation) and the size of the entry and exit pupils.
The pupils are measured with the aid of an ideally collimated bundle of laser beams, and the pupil diameter is determined with a calibrated CCD camera. An optical system that shows no weaknesses or deviations from the standards is awarded the maximum points.

Use with spectacles (max. 10 points)

Can spectacle wearers see the entire field of view? Are the eyecups easy to retract? Do they have several detent settings? Can they be completely removed for cleaning?

Mechanical quality and ease of use (max. 10 points)

Both tubes and their individual optical systems must be horizontally aligned with extreme precision. If they are not, viewing may be strenuous and cause eye strain and headaches. Field rotation must be within the specified tolerances. The housing must be watertight and the control elements such as the focusing mechanism and dioptre compensation must still be easy to move in cold conditions.

Features (max. 10 points)

Are the front lenses nano-coated? Does the package include caps for the objective lenses and oculars? Does the price include a case and a carrying strap, and are these practical and usable? Can the strap be detached easily and quickly?

Value for money (max. 10 points)

What does the product offer for the retail price? Here, we rate the performance and features offered in relation to the price.

RANGEFINDER RATING

Range max. 20 points)

What is the maximum range at which the device can determine the distance to an object the size of a car? Maximum points are awarded for 1,500 metres; one point is deducted for each step of 100 metres less than this value.

OVERALL RATINGS	
190–200 points	**excellent/ reference class**
180–189 points	**very good**
170–179 points	**good**
160–169 points	**satisfactory**
fewer than 169 points	**not to be recommended**

Measuring accuracy (max. 15 points)

There should be no deviations greater than one metre at distances up to 500 metres. On top of this, we allow a tolerance of 5% because beyond this, the information is no longer applicable for the computation of ballistic data for a rifle shot.

Display (max. 10 points)

Does the LED read-out remain perfectly legible in unfavourable light? Does the brightness adjust automatically to the lighting conditions, or can it be set to an appropriate level by hand?

Measuring accuracy and speed (max. 15 points)

Does the device frequently deliver erroneous results that require a subsequent measurement? Here, we take distances up to 600 metres as a reference. Good rangefinder systems should provide accurate and reliable results within this range. How long does it take for the read-out to appear after pressing the measuring button?

Features (max. 10 points)

Is there a short-range suppression function and a scanning mode? Can the device switch between metres and yards? Is there a low battery warning signal?

Ballistics programs (max. 15 points)

Modern rangefinders should provide the hunter with holdover information. No points are awarded if only the distance on the level is displayed. If the device has an inclinometer and provides the ballistic distance for angle shots, we consider that worth five points. If the shot correction is displayed in centimetres or clicks, that means ten points. If this correction is also calculated taking the shot angle into account, that earns the candidate the full 15 points in this category. Naturally, all this assumes that the values calculated are correct; otherwise, we would award no points at all.

Handling (max. 15 points)

How easy is it to use and program the rangefinder? Can the operating buttons be used just as well when wearing gloves?

The read-out in the high-tech binoculars in this test show the precise distance to the game you came out to hunt. Once you have this, you 'only' need to make the right conclusions …

The advantages of the Swarovski and the Leica are in their superior range, but it remains to be seen to what extent this can be exploited in practice. Our ratings saw Leica and Swarovski grabbing the full 20 points, while the Zeiss had to be satisfied with only 18.

Ballistics programs

The second rating category covers the integrated ballistics computers. The Swarovski does not display holdover correction values for the measured shot distance – in other words, it has no ballistics computer. What the Swarovski does have is an angle-shot correction function that provides the actual measured distance and the ballistics distance when measuring up- or downhill. Using this distance with a riflescope with rapid reticle adjustment (ASV) provides the holdover required. We tried this out – and it works like a charm. Things get quite a bit more difficult without ASV, and you'll have to do some calculating – certainly not an easy job in stressful situations. In line with the JAGDPRAXIS rating criteria, the Swarovski earns only five of the possible 15 points.

The other two glasses tested offer real ballistics computers and the holdover correction is displayed in centimetres or clicks.

In the case of the Zeiss, users must pick one of the hard-wired ballistic curves. We checked this on the 300-metre range with rifles zeroed at 100 metres. This works very well with normal calibres and normal-length barrels, with which the ammunition manufacturers' given parameters can be achieved. The deviations are then between five and eight centimetres in the vertical. So, when shooting deer, the shot remains in the lethal zone.

The deviations increase at greater distances. In any case, we recommend testing on the 300-metre

range to determine which ballistic curve is the best for the rifle you use; wide shots at game are otherwise irresponsible.
One thing the Zeiss doesn't offer is a correction for angle shots. Calculations are always made with the actual measured distance – not a problem as long as you are shooting on level terrain or the shot angle stays in a low number of degrees. However, the holdover correction displayed is no longer valid when shooting up- or downhill in the mountains. In such situations, the holdover corrections given by the BIS system of the Zeiss RF are much too large.
From the possible 15 points, we awarded the Zeiss ten for its accurate and reliable ballistics system without angle-shot correction.
The new Geovid offers the best system by far. The holdover correction can be displayed in either centimetres or clicks, and the shot angle is also taken into account for its calculation. What's more, the Leica can also compute with user-specific parameters, which is significantly more accurate than when using one of its hard-wired ballistic curves. On the 300-metre range, the Leica impressed the testers with holdover corrections to the precise centimetre; applying the displayed correction landed every shot in the 10!
The JAGDPRAXIS testers had no problems at all with the handling of the three models, and anyone prepared to read and follow the instructions in the manual will find the programming easy as well. As soon as everything is set up, a press of the button is all it needs.
Admittedly, importing custom parameters to the Leica from the micro-SD card involves some extra effort, but that is hardly a reason to complain.
After all, six ballistic curves that are easy to access are already programmed in. Inputting your own parameters is only an additional option, but it does deliver more accurate results, and is highly recommended for users of more exotic calibres. The Leica earned full marks from our test team for its mature and versatile ballistics program.
Summing up, this is the outcome of the JAGDPRAXIS test for the electronics category:
The clear winner in this category is the Leica, with 100 out of a maximum of 100 points. It has the longest range and the best ballistics program.
Otherwise, for simple rangefinding functions and ease of use, it is a level playing field for all three models.

Overall ratings

In the final accounting (overall points), we add together the ratings for optical performance and those for the integrated rangefinder and ballistics program.
We have intentionally awarded 100 points for each, to allow the comparison of standalone rangefinders and 8 x 42 binoculars without rangefinders at any time in the future. This makes it possible to recognise at a glance whether binoculars without the electronics or standalone rangefinders can offer more than integrated solutions.
The Zeiss was eventually able to make up ground thanks to its good ballistics program and earned the JP rating of good (two magnifying glasses) with a total of 178 points.
Great optical performance and a total of 187 points earned the Swarovski second place in our test and a rating of very good (three magnifying glasses). The clear winner of the grand JAGDPRAXIS comparison test was the Leica, with 194 points and a rating of excellent (four magnifying glasses).
Although it can't match the Swarovski in transmission or field of view, it has the better ballistics program and the rangefinder with the longest range.

As there is no significant difference between the prices of our three top glasses, the question now is 'Leica or Swarovski?'
Anyone shooting with a riflescope with rapid reticle adjustment (ASV) has no disadvantages with the Swarovski and enjoys the benefits of the currently best optical performance in this class. In contrast, the Leica offers all-round service, as the ballistics computer of the Geovid can be fed with user-specific data – a particularly interesting option for users of more exotic calibres.

An interesting observation is that the three high-performance optical devices in the JAGDPRAXIS test ended up in the exact same order in which they were launched – the latest model is also the best, and the oldest model is at the bottom of the field.
This shows that our exacting comparison ideally reflects how amazingly quickly this field is developing.

RATINGS				
	max. possible points	Swarovski EL Range	Zeiss Victory RF	Leica HD-B
Viewing optics				
Field of view	10	10	9	9
Resolving power	15	15	15	15
Transmission	15	15	8	13
Actual magnification	10	10	10	10
Overall optical package	10	10	10	10
Use with spectacles	10	10	10	10
Mechanical quality and ease of use	10	10	8	10
Features	10	9	9	9
Value for money	10	8	6	8
Rangefinders				
Range	20	20	18	20
Measuring accuracy	15	15	15	15
Display	10	10	10	10
Measuring accuracy, speed	15	15	15	15
Features	10	10	10	10
Ballistics program	15	5	10	15
Handling	15	15	15	15
Total points	**200**	**187**	**178**	**194**
JAGDPRAXIS test rating		**very good**	**good**	**excellent**